

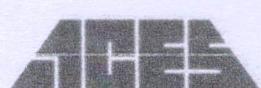
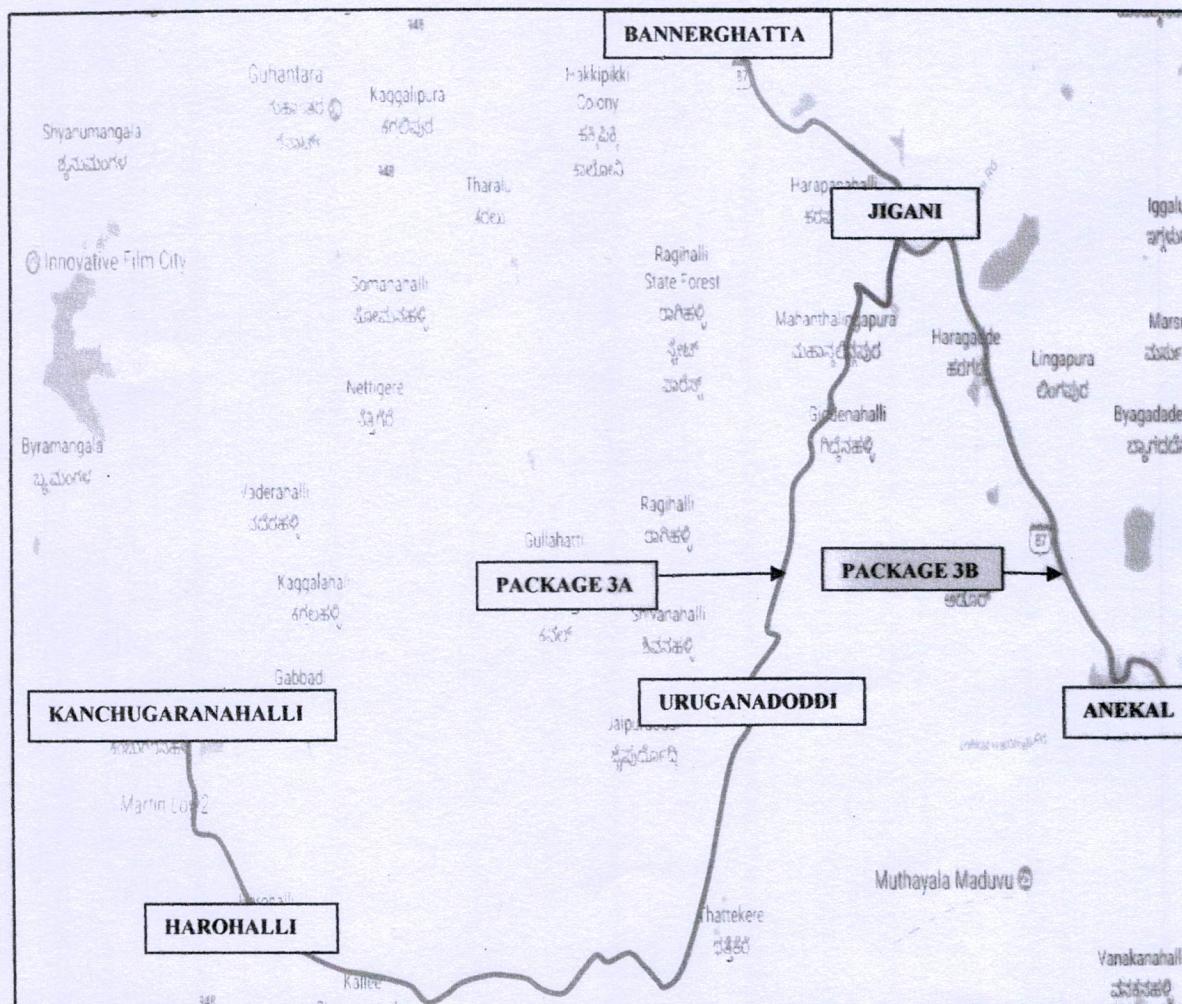


Karnataka Road Development Corporation Limited

(A Government of Karnataka Enterprise)

Feasibility Report for "Development of Road from Harohalli (NH-209) to Anekal (SH-35) via Uruganadoddi-Jigani and KIADB Industrial Area in Bangalore Urban/rural district, Karnataka"

Executive Summary



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EXECUTIVE SUMMARY

0.1 Background

Bangalore, the capital of Karnataka is the fifth largest city in the country and is growing at a rate, which is significantly higher than most others. Due to the growth in economic activities, the city is attracting migrants. To serve this influx of population, residential layouts are being developed. Being a demographically diverse city, Bangalore today has developed into India's major economic hubs and is the fastest growing major metropolis. As the leading IT employer and exporter, it is known as the Silicon Valley of India. But adequate transport infrastructure facilities such as roads, grade separators, subways, elevated corridors, mass transit system etc., matching this demand are conspicuously absent. The additional demand is to be catered by the already saturated road network. Due to the inherent road network in Bangalore, there are on the average 2 major and 2 minor junctions per kilometre of road length. This has resulted in increase in travel time due to frequent bottlenecks and breakdowns.

To ease the traffic congestion and to ensure bypassing the through traffic, Government of Karnataka (GoK) has implemented Outer Ring Road (ORR). But due to the rapid development, city has grown beyond the ORR. Nice Corridor has been implemented linking Bangalore-Mumbai Road (NH-4), Bangalore-Bantwal Road (NH-275), Bangalore-Kanakapura Road (NH-209) and Bangalore-Hosur Road (NH-7). This loop partially bypasses the through traffic in the south and south-west of Bangalore. With the commissioning of new airport at Devanahalli, the traffic originating/destined to airport from various parts of the city is continuously growing. It is reported that, airport has served 12.39 million passengers in the first half of financial year (2017-2018) and reported a growth of 11.7% in overall traffic. Further, the average passenger movement per day observed was 67,700.

To bypass the through traffic passing through the city and to ensure a better facility for the road users commuting from southern and eastern parts of the city (such as Harohalli, Anekal, Sarjapur, Varthur, Whitefield, Hoskote etc.,) to various industries in eastern part of Bangalore and to Bangalore international Airport, Government of Karnataka (GoK) has initiated the road projects to decongest the traffic within Bangalore. Further GoK has mandated Karnataka Road Development Corporation Limited (KRDCL) to implement the following four road projects:

1. *Leviathan* (1651) is a political treatise by Thomas Hobbes. It discusses the nature of human life in a state of nature and the reasons for forming a civil society. Hobbes argues that in the state of nature, life is "solitary, poor, nasty, brutish, and short." He believes that the only way to ensure peace and order is through a social contract where individuals give up their natural rights to a central authority, the Leviathan, which represents the "absolute power" of the state.

2. *On the Civil War in Ireland* (1649) is a political tract by John Lilburne. It discusses the English Civil War and the role of the Puritan army in Ireland. Lilburne argues that the war was a just cause for the Puritans, who were fighting against the "tyranny" of King Charles I and the "catholic" Church of England. He also criticizes the "levellers" for their "atheistic" and "atheistical" beliefs.

3. *Common Sense* (1776) is a political pamphlet by Thomas Paine. It argues for the independence of the American colonies from Great Britain. Paine's main argument is that the colonies are "more equal" than the British, and that they have a "natural right" to self-government. He also criticizes the British for their "tyranny" and "oppression" of the colonies.

4. *On Liberty* (1859) is a political treatise by John Stuart Mill. It discusses the nature of political power and the importance of individual liberty. Mill argues that political power should be limited, and that individuals should have the right to "liberty of thought, expression, and action." He also criticizes the "tyranny" of the state and the "oppression" of individual rights.

5. *On the Subjection of Women* (1869) is a political tract by John Stuart Mill. It argues for the equality of women and the right of women to "liberty of thought, expression, and action." Mill also criticizes the "tyranny" of men and the "oppression" of women.

Road No.	Road Details	Length, Km
1	Development of Road from Hoskote Budigere Cross (NH-4) to Kempegowda International Airport road via Budigere- Singahalli and Mylanahalli in Bangalore Urban/rural district, Karnataka.	22.000
2	Development of Road from Nelamangala (NH-4) to Devanahalli Road (NH-07) via Madhure-Byatha-Rajanukunte-Thimmasandra and M.V Solars in Bangalore Urban/rural district, Karnataka.	43.500
3	Development of Road from Harohalli (NH-209) to Anekal (SH-35) via Uruganadoddi-Jigani and KIADB Industrial Area in Bangalore Urban/rural district, Karnataka.	42.000
4	Development of Road from Anekal (SH-87) to Hoskote (NH-04) via Attibele-Sarjapura-Varthuru-Whitefield Road and Kattonnallur in Bangalore Urban/rural district, Karnataka.	47.500
	Total	155.000

With the implementation of improvements to the roads as above, it is expected that improved roads would ensure enhanced level-of-service, driving comfort and safety of commuting traffic apart from reducing traffic congestion on city roads. In addition to the better facility for the commuters accessing the various industries and airport (as above), these roads would also serve the commuting needs of various major settlements/villages located along and close to the project road.

0.2 Site Characteristics

The road section between Kanchugaranahalli to Besthamanahalli (on SH-35 including Anekal bypass) is 56.180 km in length, comprising of section between Kanchugaranahalli to Jigani via Harohalli and Uruganadoddi for a length of 33.200 Kms (including Harohalli bypass and Krishnadodi bypass) and section between Bannerghatta (on SH-87) to Besthamanahalli (on SH-35, including Anekal Bypass) via Jigani and Haragadde for a length of 22.980 Kms. The slicing of the project road is judiciously proposed so as to ensure ease of implementation of the project with minimum inconvenience to road users, to reap maximum benefits as early as possible and with minimum construction period.

Proposed Road Section Details

Road No.	Road Details	Length, Km
3A	Section between Kanchugarnahalli to Jigani (on SH-87)	33.200
3B	Section between Bannerghatta (on SH-87) to Besthamanahalli (on SH-35 including Anekal Byapss)	22.980
	Total	56.180

The land use on either side is predominantly irrigated agricultural land except near settlements where it is residential / commercial (Hotels, shops etc.). Project road passes through Anekal forest area for a length of 3.900 Kms (Km 18.200 to Km 22.100). The project road passes through several settlements such as Harohalli, Uruganadoddi, Krishnadoddi, Jigani, Bannerhghatta, Haragadde and Anekal. The project road passes generally through plain/rolling terrain. The existing Road section comprises of Intermediate/two lane/ four lane divided

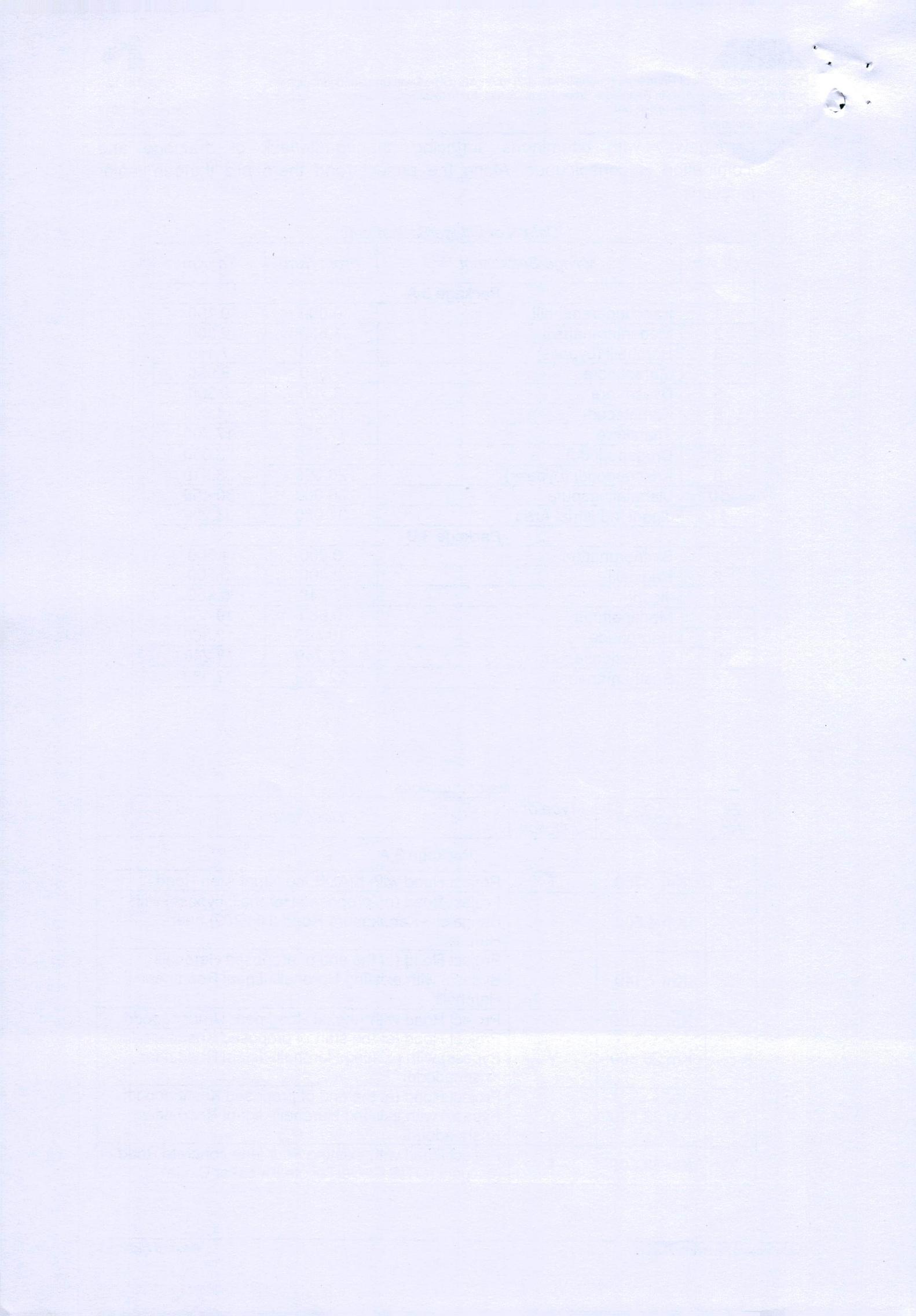
carriageway with bituminous surfacing. Inadequate/lack of drainage and illumination is conspicuous. Along the project road there are thirteen major junctions.

Details of Village/ Settlements

Sl. No	Village/ Settlement	From (Km)	To (Km)
Package 3 A			
1	Kanchugaranahalli	0.000	0.100
2	Medamaranahalli	1.600	2.300
3	Harohalli (bypass)	4.500	7.140
4	Marasandra	7.550	8.050
5	Dyasandra	8.700	9.300
6	Kamalapura	14.200	14.600
7	Thatekere	17.350	17.700
8	Uruganadoddi	22.750	23.050
9	Krishnadoddi (bypass)	26.390	28.810
10	Mahatalingapura	30.000	30.450
11	Jigani Industrial Area	31.980	33.200
Package 3 B			
1	Bannerghatta	0.000	1.500
2	Ragihalli	2.400	3.500
3	Jigani	7.740	9.960
4	Madapattana	9.960	10.460
5	Haragadde	10.460	12.360
6	Honnakalasapura	17.740	18.240
7	Besthamanahalli	22.600	22.980

Major Junctions

Sl. No.	Location	Type of Junction	Description
Package 3 A			
1	Km 2.700	T	Project Road with KIADB Industrial Area Road
2	Km 4.500	+	Project Road (on proposed Harohalli bypass) with Bangalore-Kanakapura Road (NH-209) near Harohalli
3	Km 7.140	Y	Project Road (at the end of proposed Harohalli Bypass) with existing Harohalli-Jigani Road near Harohalli
4	Km 23.100	Y	Project Road with Anekal Road near Uruganadoddi
5	Km 26.390	Y	Project Road (at the start of proposed Krishnadoddi Bypass) with existing Harohalli-Jigani Road near Krishnadoddi
6	Km 28.810	Y	Project Road (at the end of proposed Krishnadoddi Bypass) with existing Harohalli-Jigani Road near Krishnadoddi
7*	Km 33.200	T	Project Road with existing Four lane concrete Road at Jigani (OTIS Circle/Toyota Kirloskar Circle)



Package 3 B			
8	Km 0.000	T	Project Road with Bannerghatta Road near Bannerghatta
9	Km 6.900	T	Project Road with start of existing Four lane concrete Road at Jigani
10 *	Km 7.740	T	Project Road with existing Four lane concrete Road at Jigani (OTIS Circle/Toyota Kirloskar Circle)
11	Km 9.160	+	Project Road with end of existing Four lane concrete Road at Jigani
12	Km 15.360	T	Project Road with Indlawadi Road
13	Km 18.240	Y	Project Road (at the start of proposed Anekal bypass) with existing Jigani-Anekal Road near Anekal
14	Km 22.980	Y	Project Road (at the end of proposed Anekal bypass) with existing Jigani-Anekal Road near Besthamanahalli

(Note; * - Common Junction)

0.3 Engineering Surveys and Field Investigations

The following primary surveys were conducted as per standard practices to assess condition of road and CD structures, soil characteristics, traffic characteristics etc., to assess the needs of improvement for the existing project road:

- ⇒ *Reconnaissance Survey*
- ⇒ *Road Inventory Survey*
- ⇒ *Pavement Condition Survey*
- ⇒ *Traffic Survey*
- ⇒ *Topographic/Levelling Survey*
- ⇒ *Inventory and Condition Survey of Bridges and CD Structures*

0.4 Design Standards

Design standards relevant to the project road along with the broad list of design parameters and the relevant IRC codes/specifications have been compiled under the following heads:

- ◊ *Design Standards Related to Geometric Design and Road Capacity*
- ◊ *Design Standards Related to Pavement Design*
- ◊ *Design Standards Related to Road Drainage*
- ◊ *Design Standards Related to Road Furniture and Appurtenances*
- ◊ *Design Standards Related to Bridges and CD Structures*

0.5 Data, Analysis and Improvement Proposals

0.5.1 Traffic Data Analysis and Traffic Loading for Pavement Design

Average Daily Traffic at different locations is presented below:

Summary of Traffic Volume (September 2017)

Vehicle Type	Km 7.500, near Harohalli (after the end of proposed Harohalli bypass)	Km 29.000, Near Krishnadoddi	Km 6.000, Near Jigani	Km 19.500, Near Anekal
Package	Package 3 A		Package 3 B	
Two Wheelers	3407	2286	14270	8803
Auto Rickshaw	419	164	709	394
Car/Jeep/Van/Taxi	608	819	9021	2477
Mini Bus	25	41	883	216
Standard Bus	54	38	524	329
LCV	337	514	2599	656
2 Axle Truck	89	65	1584	216
3-Axle Truck	72	37	690	177
MAV (>3 Axle)	13	2	142	66
OSV	0	0	14	3
Others (HCM/EME)	4	0	28	4
Agriculture Tractor	2	5	20	14
Agri. Tractor with Trailer	47	38	133	133
A/H Drawn Vehicles	2	4	5	0
Cycle	8	36	286	119
Cycle Rickshaw	0	0	4	0
Total	Vehicles	5087	4049	30912
	PCU	4123	3559	13607
				11662

On the basis of homogeneity of traffic the project corridor is classified into following four sections.

➤ *Package 3 A*

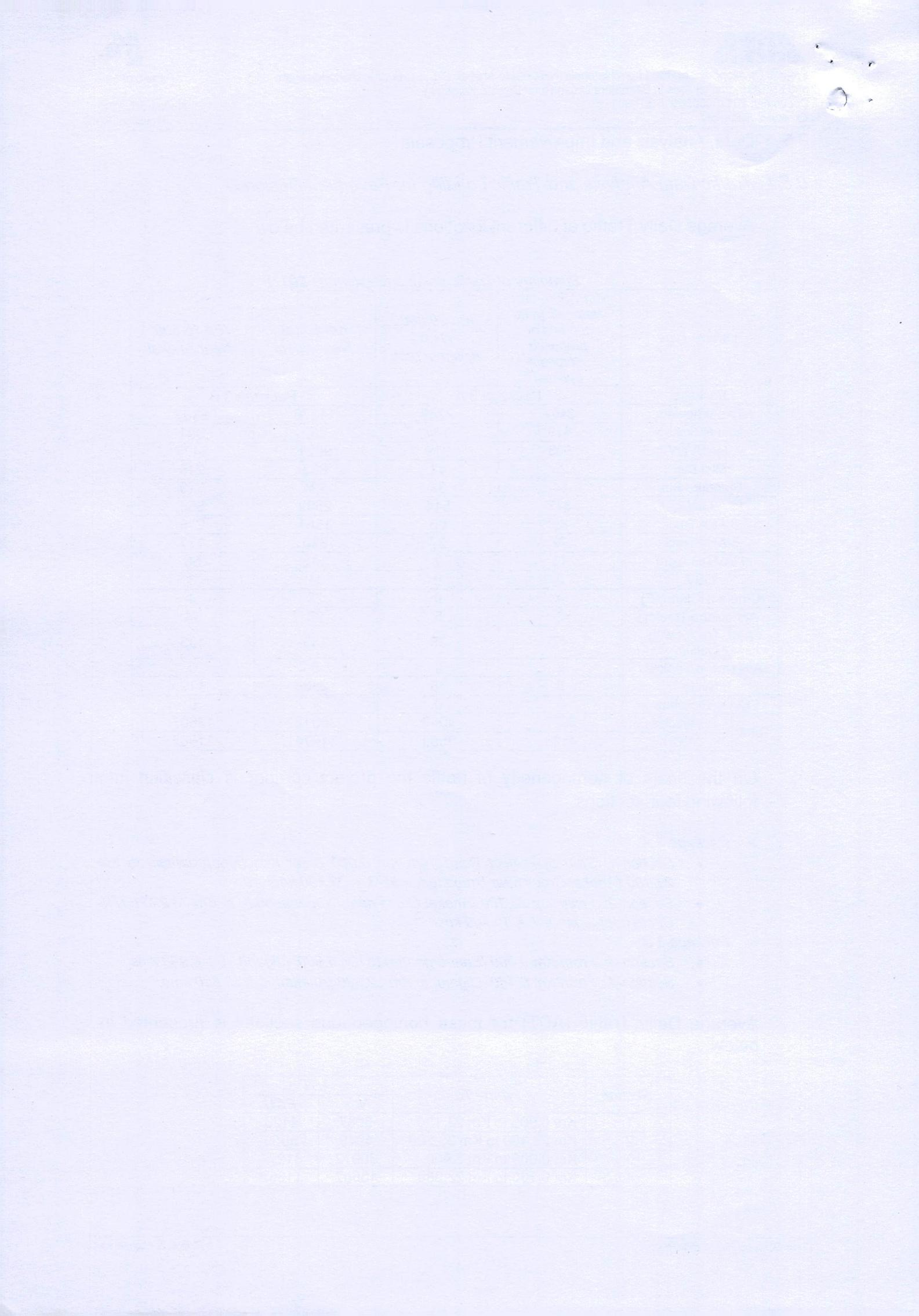
- *Section-1: Start of Project Road from Km 0.000 (near Kanchugaranahalli) to Km 23.100 (Anekal Cross near Uruganadoddi), L = 23.100 kms*
- *Section-2: From Km 23.100 (Anekal Cross near Uruganadoddi) to Km 33.200 (OTIS Circle near Jigani), L = 10.100 kms*

➤ *Package 3 B*

- *Section-3: From Km 0.000 (Bannerghatta) to Km 6.900 (Jigani), L = 6.900 kms*
- *Section-4 : From Km 9.160 (Jigani) to Km 22.980 (Anekal), L = 13.820 kms*

Average Daily Traffic (ADT) for these homogeneous sections is presented in below:

Section	From - To	ADT	
		Nos.	PCU
1.	Km 0.000 to Km 23.100	5087	4123
2.	Km 23.100 to Km 33.200	4049	3559
3.	Km 0.000 to Km 6.900	30912	31974
4.	Km 9.160 to Km 22.980	13607	11662



Design Traffic Loading

The expected cumulative standard axles in the horizon year vary in the range of 3.0-39.2 msa (15 year) and 5.1-64.8 msa (20 year) for the project road respectively for the homogenous sections as detailed below:

Section wise Traffic Loading for the Project Road

Sl. No.	Road Section	Bus	LCV	2AT	3AT	MAV	Total	CSA in Millions		
								10 Years	15 Years	20 Years
1	HS1 - Km 0.000 to Km 23.100	54	337	89	72	13	565	2.0	3.7	6.3
2	HS2 - Km 23.100 to Km 33.200	38	514	65	37	2	656	1.6	3.0	5.1
3	HS3 - Km 0.000 to Km 6.900	524	2599	1584	690	156	5553	21.3	39.2	64.8
4	HS4 - Km 9.160 to Km 22.980	329	656	216	177	69	1447	4.7	8.7	14.6

0.5.2 Road Inventory

The existing lane configuration comprise of 5.100 Km of intermediate lane (9.1%), 43.420 Km of two lane (77.3%) and 7.66 Km of four lane including that under construction (13.6%).

0.5.3 Test Pit Investigation and Subgrade Evaluation

Generally the top layer comprise of bituminous layer (of 50-110mm thick) over base layers (of 320-450mm thick comprising of WBM of 120-150mm and GSB/Murrum of 200-300mm) which are naturally consolidated over a period of time due to movement of traffic.

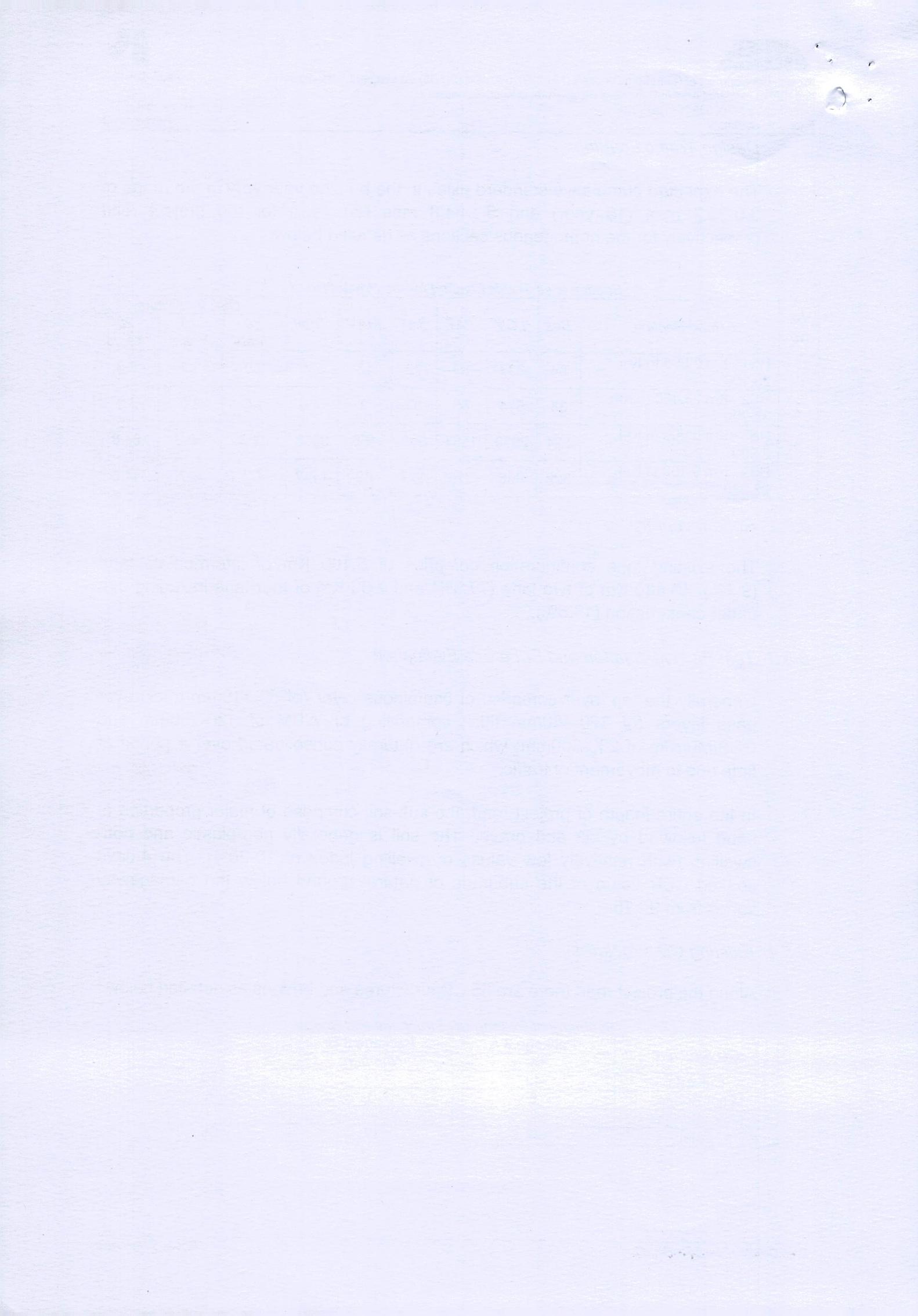
In the entire length of project road, the sub-soil comprise of major proportion of sand followed by silt and gravel. The soil is generally non-plastic and non-swelling (with relatively low values of swelling index of 10-20%). The 4-days soaked CBR value of the subgrade of natural ground below the carriageway varies from 9 - 15.

0.5.4 Existing CD structures

Along the project road there are 65 CD structures and bridges as detailed below.

Summary of Existing CD Structures and Bridges

CD Structure	Package 3 A	Package 3 B	Total	Numbers	
Culverts	42	17	59		
Minor Bridges	6	0	6		
Major Bridges	-	-	-		
Total	48	17	65		



0.5.5 Proposed Improvements

The improvement proposals considered are:

➤ **Package 3 A:**

- ◊ Two lane, 7m wide carriageway, with 1.5m wide paved shoulders on either side and 1.2m wide RCC open drain (12.4m road width) in rural sections;
- ◊ Two lane, 7m wide carriageway, with 1.5m wide paved shoulders on either side and 1.5m wide footpath cum covered RCC drain (13.0m road width) in urban sections near village/settlements;
- ◊ Two lane, 7m wide carriageway, with 1.5m wide paved shoulders and 1.0m earthen shoulders and 0.6m wide open earthen drain on either side (12.0m road width) in forest section; and
- ◊ Four lane (2x7.50m) divided carriageway with central New Jersey crash barrier cum median (0.6m) and 1.20m wide RCC open drain on either side (18.0m road width) in the proposed Harohalli bypass in this project.

➤ **Package 3 B:**

- ◊ Four lane (2x7.50m) divided carriageway with central New Jersey crash barrier cum median (0.6m) and 1.20m wide RCC open drain (18.0m road width) in rural sections;
- ◊ Four lane (2x7.50m) divided carriageway with central New Jersey crash barrier cum median (0.6m) and 1.50m wide footpath cum drain (18.6m road width) in urban sections near village/settlements;
- ◊ Provision of Median in the four laned road under construction near Indlawadi for 3.000 Km; and
- ◊ Provision of overlay before the end of construction period in the four laned road at Indlawadi (3.000 Km, under construction) and Bannerghatta Road (2.400 Km).

➤ **Anekal Bypass Section of Package 3 B:**

- ◊ Four lane (2x7.50m) divided carriageway with central New Jersey crash barrier cum median (0.6m) and 1.20m wide footpath cum drain (18.0m road width) in rural sections;
- ◊ Four Lane (2x7.50m) divided carriageway with central New Jersey crash barrier cum median (0.6m) and 2x0.5m wide kerb and crash barrier (16.6m width at grade separator) bi-directional Grade Separator across Chandapura Road including at-grade road (2x6m) and RCC open drains (2x1.2m) (31.6m width at ramps);
- ◊ Four Lane (2x7.50m) divided carriageway with central New Jersey crash barrier cum median (0.6m) and 2x0.5m wide kerb and crash barrier (16.6m width at ROB) bi-directional ROB across existing Railway line.

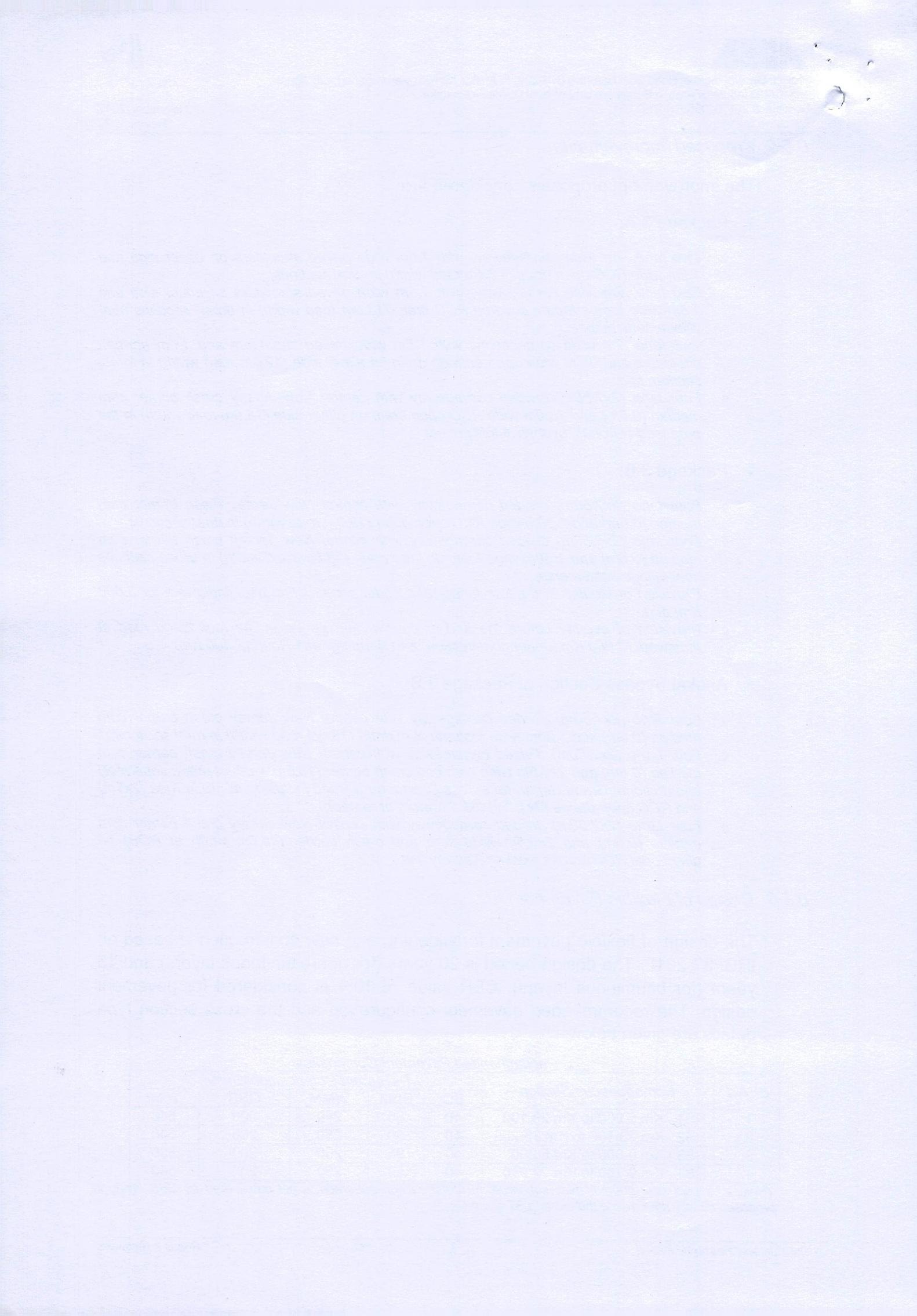
0.5.6 Design of Flexible Pavement

The design of flexible pavement for widening and new construction is based on IRC: 37-2012. The design period is 20 years (for non-bituminous layers) and 15 years (for bituminous layers). CBR value of 10% is considered for pavement design. The recommended pavement configuration and the cross section type details are given below:

Recommended Pavement Composition

Sl. No.	Homogeneous Section	Pavement Composition* in mm				
		BC	DBM	WMM	GSB	Total
1.	HS1 - Km 0.000 to Km 23.100	40	50	250	200	540
2.	HS2 - Km 23.100 to Km 33.200	40	50	250	200	540
3.	HS3 - Km 0.000 to Km 6.900	40	95	250	200	585
4.	HS4 - Km 9.160 to Km 22.980	40	50	250	200	540

(Note - * - Laid over 500mm thick subgrade; In forest section subgrade is not considered as GSB laying is proposed directly after milling the existing BT layers)



For improvement of entire project road the length of road in each type of cross section is given in Table below.

Proposed Carriageway Configuration (Package 3A)

Sl. No.	Carriageway Type	Length, km
1	Two Lane Carriageway with Paved Shoulders and RCC open drains in Rural Section	22.140
2	Two Lane Carriageway with Paved Shoulders and RCC covered drains in Urban Section	4.520
3	Two Lane Carriageway with Paved Shoulders and earthen drains in Forest Section	3.900
4	Four Lane Divided Carriageway and RCC open drains in Harohalli Bypass	2.640
	<i>Total</i>	<i>33.200</i>

Proposed Carriageway Configuration (Package 3B)

Sl. No.	Carriageway Type	Length, km
1	Four Lane Divided Carriageway and RCC open drains in Rural Section	11.170
2	Four Lane Divided Carriageway and RCC covered drains in Urban Section	3.200
3	Median Provision & overlay provision in the four laned road under construction near Indlawadi	3.000
4	Overlay Provision in the four laned road near Bannerghatta	2.400
5	Four Lane bidirectional Grade Separator with intermediate lane at-grade road and RCC open drains on either side	0.450
6	Four Lane bidirectional ROB	0.500
7	Do-nothing (in four laned concrete road at Jigani)	2.260
	<i>Total</i>	<i>22.980</i>

0.5.7 Junction Improvements

Comprehensive junction improvements to cater the geometric needs to the extent possible have been proposed for thirteen major junctions along the project road. In addition other junctions have been proposed for adequate improvements. Landscaping is proposed at the islands of all the major junctions.

0.5.8 Proposed Improvement for Bridges and CD Structures

Summary of improvement proposals to Bridges and CD structures are below:

*Summary of Improvement Proposals for Bridges and CD Structures Package 3 A
 (Km 0.000 - Km 33.200)*

Improvement proposal for	Number of Existing Structures	Re Construction	New Construction	Widening and minor maintenance	Minor maintenance	Do nothing
CD Structures						
RCC Pipe Culvert	10	6	7	2	-	2
Stone Slab Culvert	6	5	-	-	-	1
RCC Slab Culvert	26	12	1	10	-	4
Total	42	23	8	12	-	7
Minor Bridges						
RCC Slab Bridge	6	1	1(Harohalli Bypass)	3	1	-
Total	6	1	1	3	1	-

*Summary of Improvement Proposals for Bridges and CD Structures Package 3 B
 (Km 0.000 - Km 22.980)*

<i>Improvement proposal for</i>	<i>Number of Existing Structures</i>	<i>Re Construction</i>	<i>New Construction</i>	<i>Widening and minor maintenance</i>	<i>Minor maintenance</i>	<i>Do nothing</i>
CD Structures						
RCC Pipe Culvert	-	-	3	-	-	-
Stone Slab Culvert	-	-	-	-	-	-
RCC Slab Culvert	17	7	2	3	-	7
Total	17	7	5	3	-	7
Minor Bridges						
RCC Slab Bridge	-	-	1 (Anekal Bypass)	-	-	-
Total	-	-	1	-	-	-
Grade Separator Structure						
Grade Separator	-	-	1 (Anekal Bypass)	-	-	-
ROB						
ROB	-	-	1(Anekal Bypass)	-	-	-

All the CD structures have been proposed for numbering as per IRC:7-1971. At all minor bridges precast RCC posts depicting the bridge details (as per the standard posts of bridges built by KRDCL) have been proposed.

0.5.9 Drainage

Open/covered drains of Pre-cast RCC M20 and perforated precast RCC slab (M20) as top cover (to serve as footpath for pedestrians) are proposed. Drain size is kept as 1.2mx0.9m and 1.5mx0.9m (clear). Open earthen drains are proposed in the forest section. Culverts are proposed at road crossings across all the roads intersecting the project road to achieve continuity of drains in the longitudinal direction.

0.5.10 Street Furniture

Adequate road furniture comprising of road signs, road markings, delineators, guard posts and crash barriers have been proposed at appropriate locations for the safety of road users as per the guidelines stipulated in relevant IRC codes keeping in view the site requirements. At all the major junctions appropriate road signs, road markings and pedestrian crossings are proposed as per IRC. For the safety of pedestrians, raised and illuminated pedestrian crossings (Zebra Range) have been proposed. Thermoplastic materials and retro reflective sheeting are proposed. In post construction scenario, to ensure the amenities, project facilities like bus bays and truck laybys are proposed along the project road.

0.5.11 Utility Crossing

To avoid frequent cutting of road for laying/maintaining/repair of utility services especially near settlements it is proposed to have RCC pipe duct of 300mm dia. in three rows for three utility services, at every 250m intervals across the roadway for full width near settlement locations and at every 1 Km interval in rural sections.

Land Acquisition

Based on the observed/available RoW, the extent of land acquisition is assed for the proposed improvement proposal. About 33.83 acres of land needs to be acquired along the project road of Package 3A (from Km 0.000 to Km 33.200) and about 31.79 acres of land needs to be acquired along the project road of Package 3B (from Km 0.000 to Km 22.980) to accommodate the proposed improvement proposal.

Construction Period

As the project road passes through plain/rolling terrain, twenty four month construction period is suggested adopting modern construction equipments and construction methodology.

Traffic Management and Traffic Diversion

As the project road passes through plain/rolling area and mainly in rural stretches except few settlements, an appropriate construction methodology is prerequisite to prevent disturbance to existing traffic. Disturbance to traffic is inevitable during implementation but the same shall be kept as minimum as possible. Roads cannot be closed fully, except during night times /short periods and accordingly the major quantum of construction activities shall be scheduled during night hours. On-site activities shall be kept minimum and products from off-site activities such as footpath slabs, kerb, components of CD structures etc., shall be brought to the site in ready-to-install condition. Safety of workers and public shall be ensured in accordance with IRC: SP-55-2014 "Guidelines for Traffic Management in Work Zones". The temporary diversion road shall ensure requirements as stipulated in guidelines of IRC: SP: 55-2014.

Construction Methodology

Proper planning and strict adherence to construction program could ensure the success of the project implementation and least disturbance to movement of vehicles and least inconvenience to public. Adoption of modern construction methodology incorporating modern equipments/machineries shall be made. Strict control over implementation in terms of time and quality will go a long way in achieving the objectives of this project.

0.6 Project Cost

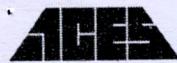
The estimated project cost is mainly based on the rates derived after rate analysis using KPW, P&IWTD SR 2016-17, South Zone. Quantities of each of the item have been estimated based on the improvement proposals suggested and by making use of the typical cross sections/standard drawings developed.

For Package 3A, the estimated cost of construction is Rs. 121.40 crores and the total project cost is Rs.199.29 Crores. For Package 3B, the estimated cost of construction is Rs. 119.79 Crores and the total project cost is Rs.194.11 Crores. Abstract of cost estimates is as below:

Abstract of Cost Estimates (Package 3)

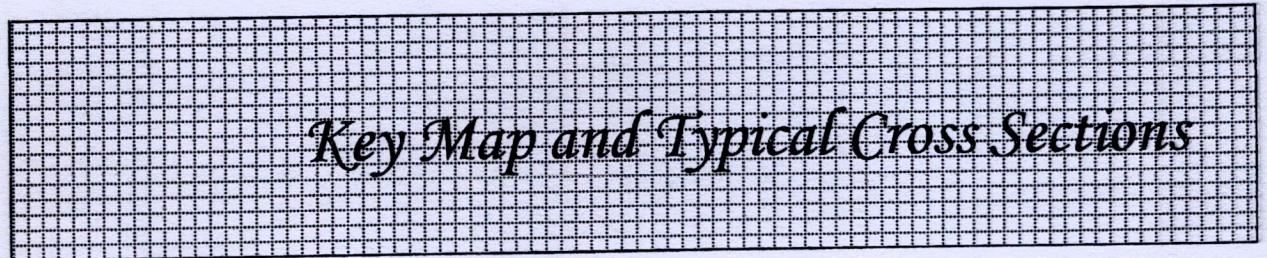
Sl. No	Item	Amount, Rs.Crores	
		Package 3A	Package 3 B
1	Site Clearance and Dismantling	0.18	0.10
2	Earth Works	14.43	11.86
3	Granular Sub Base course and Base courses	27.69	17.12
4	Bituminous Courses	22.45	21.77
5	Slab,,Box and Pipe Culverts	5.56	1.98
6	Major and Minor Bridges	5.19	0.90
7	Drainage and Protection Works	22.07	16.72
8	Traffic Signs, Marking and Other Appurtenances	8.87	8.81
9	Bus Bay and Truck Laybyes	1.60	0.92
10	Major and Minor Junctions	6.54	3.50
11	Retaining Wall and Toe Wall	6.82	3.41
12	ROB Works at Anekal Bypass	-	20.71
13	Grade Separator Works (across Chandapura Cross at Anekal Bypass)	-	11.99
	Civil Cost, Rs. Crores	121.40	119.79
1	Physical Contingencies @ 5%	6.07	5.99
2	DPR and PMC Charges @ 3%	3.64	3.59
3	KRDCL Administrative Charges @ 5%	6.07	5.99
4	Road Safety Audit Charges @ 0.5%	0.61	0.60
	Price Contingencies @ 5% each for 2 years	12.14	11.98
	Total Cost Including Centages	149.93	147.94
	Land Acquisition Cost, Rs. Crores	37.22	34.19
	Utility Relocation Cost, Rs. Crores	12.14	11.98
	Total Project Cost, Rs. Crores	199.29	194.11
	Length of Project, Km	33.20	22.98
	Cost per Km with Centages	4.52	6.44
	Cost per Km without Centages	3.66	5.21
	Cost per Km Project Cost	6.00	8.45

It is very important to preserve and maintain the road and CD structures in good/traffic worthy condition even after the construction by periodic and routine maintenance as per standard practices to preserve the precious road assets created.



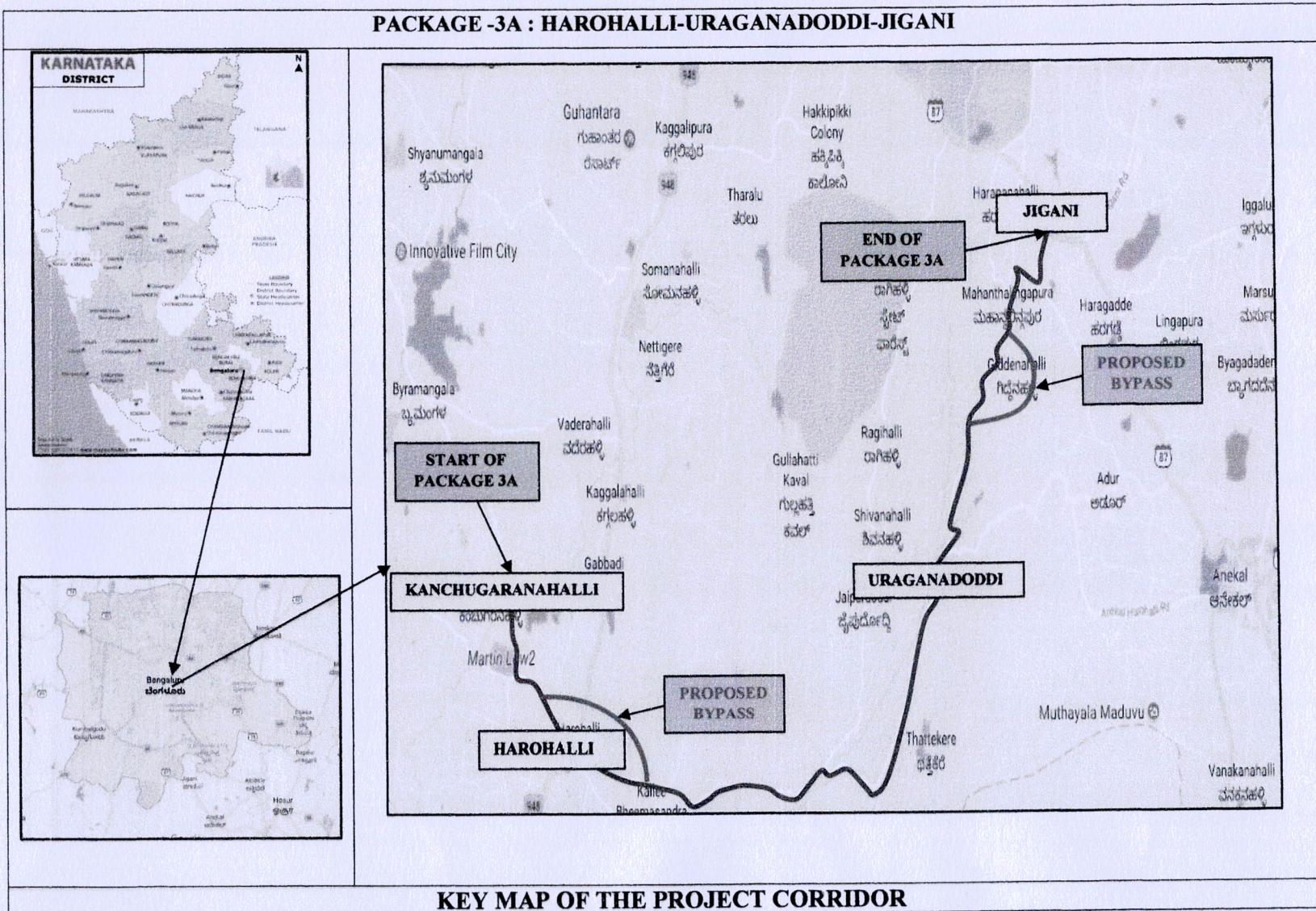
0.7 Salient Features

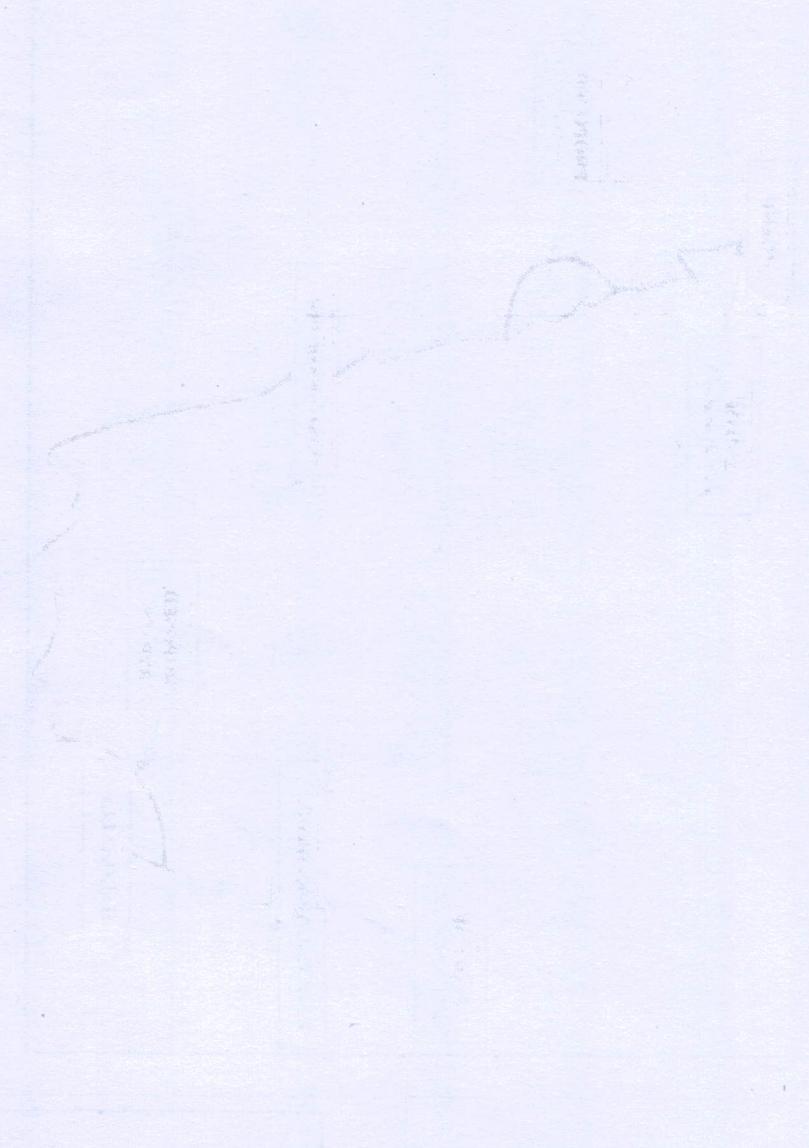
- ✓ Total Length - 56.180 Km
 - ◊ Package 3A - Kanchugaranahalli to Jigani (including Harohalli bypass of 2.640 Km length and Krishnadoddi Bypass of 2.420 Km length), Length - 33.200 Km
 - ◊ Package 3B - Bannerghatta to Besthamanahalli (including Anekal Byapss of 4.740 Km length), Length - 22.980 Km
- ✓ Lane Configuration
 - ◊ Package 3A - Two Lane Road with Paved Shoulders (except in Harohalli Bypass - 4 lane divided carriageway)
 - ◊ Package 3B - Four Lane Divided Carriageway
- ✓ Junction Improvements - 13 Nos.
- ✓ Minor Bridges - 8 Nos.
- ✓ Culverts - 72 Nos. (Reconstruction, Widening & new construction)
- ✓ Grade Separator - 1 No. (Across Chandapura road on Anekal bypass)
- ✓ ROB - 1 No. (Across railway cross on Anekal bypass)
- ✓ Land Acquisition - 65.62 Acres
 - ◊ Package 3 A - 33.83 Acres
 - ◊ Package 3 B - 31.79 Acres
- ✓ Construction Cost - Rs.241.19 Crores
 - ◊ Package 3 A - Rs.121.40 Crores
 - ◊ Package 3 B - Rs.119.79 Crores
- ✓ Total Project Cost - Rs.393.40 Crores
 - ◊ Package 3 A - Rs.199.29 Crores
 - ◊ Package 3 B - Rs. 194.11 Crores
- ✓ Construction Period - 24 Months



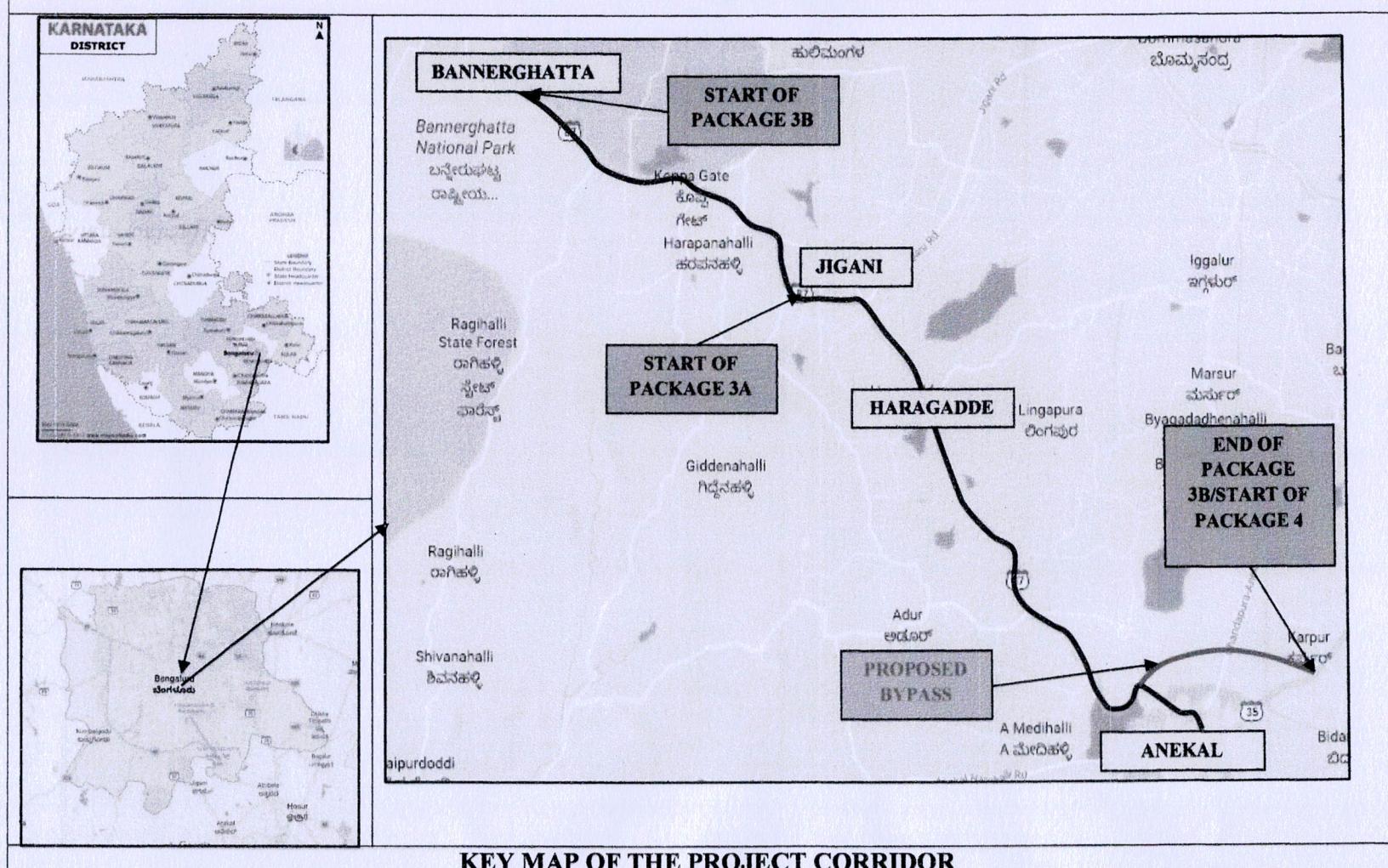
Key Map and Typical Cross Sections

PACKAGE -3A : HAROHALLI-URAGANADODDI-JIGANI





PACKAGE -3B : BANNERGHATTA-JIGANI-ANEKAL



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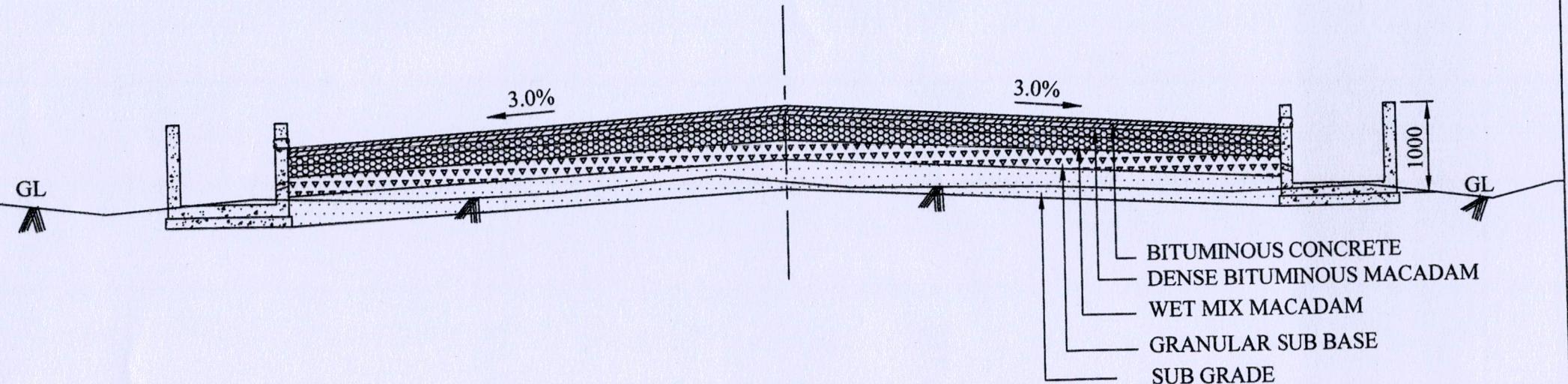
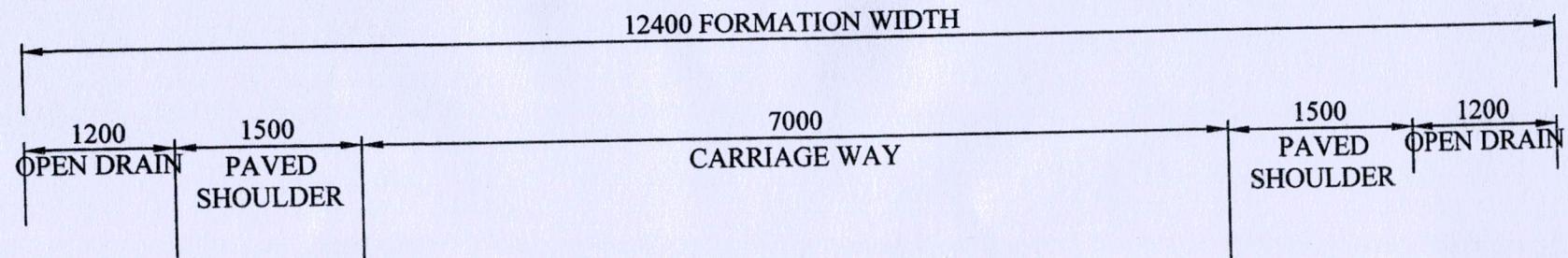
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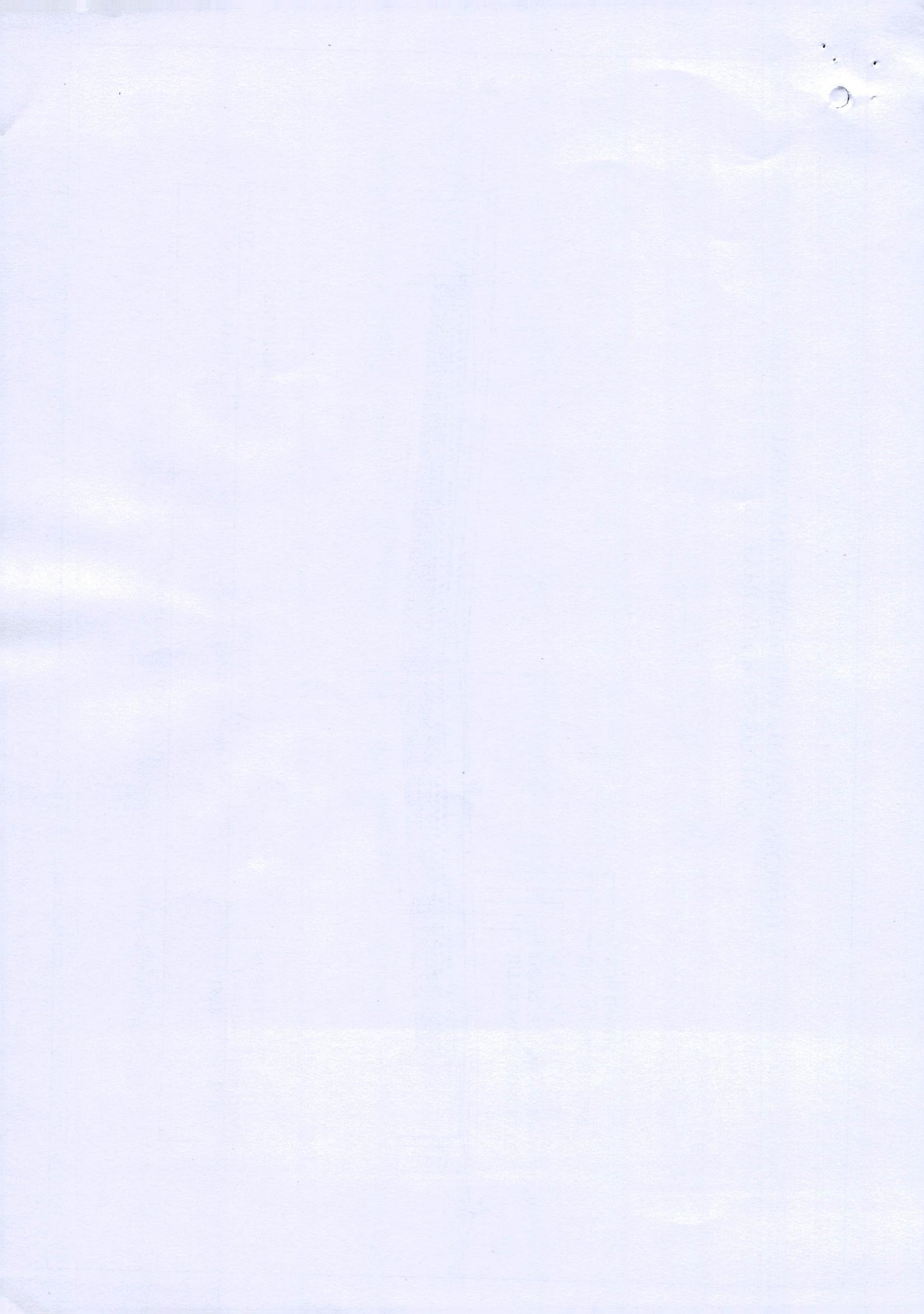
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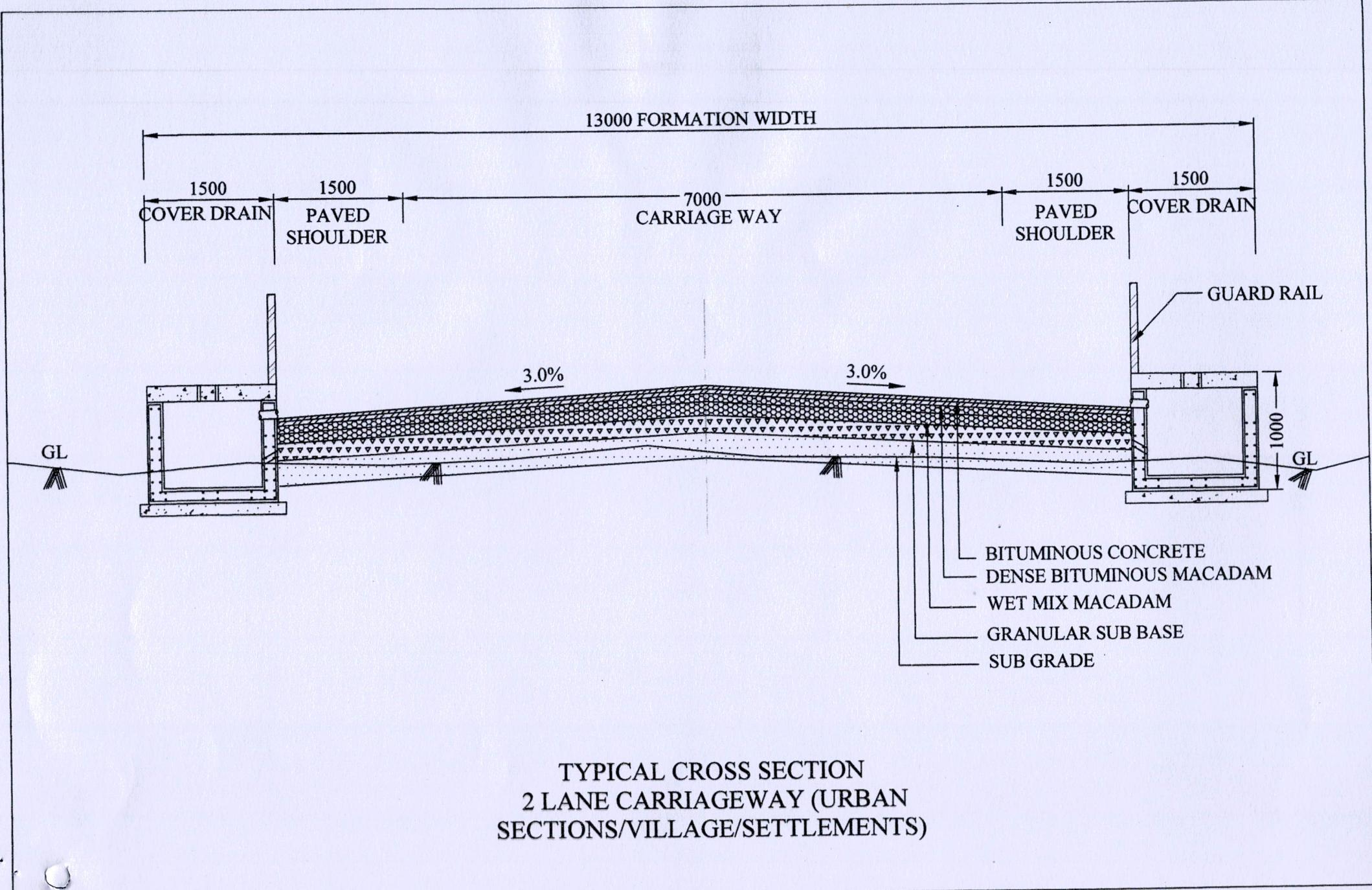
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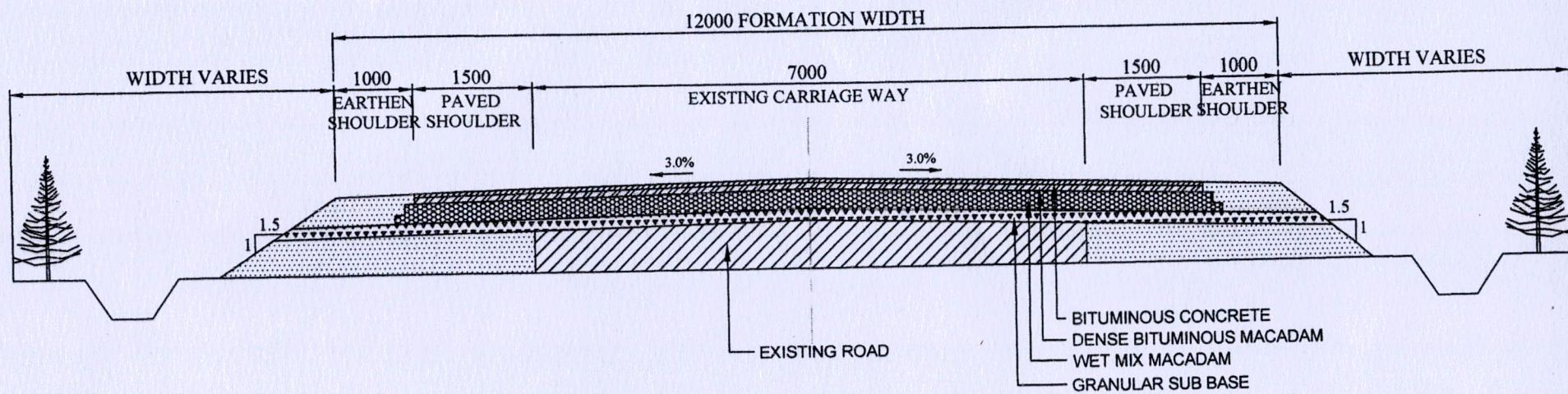
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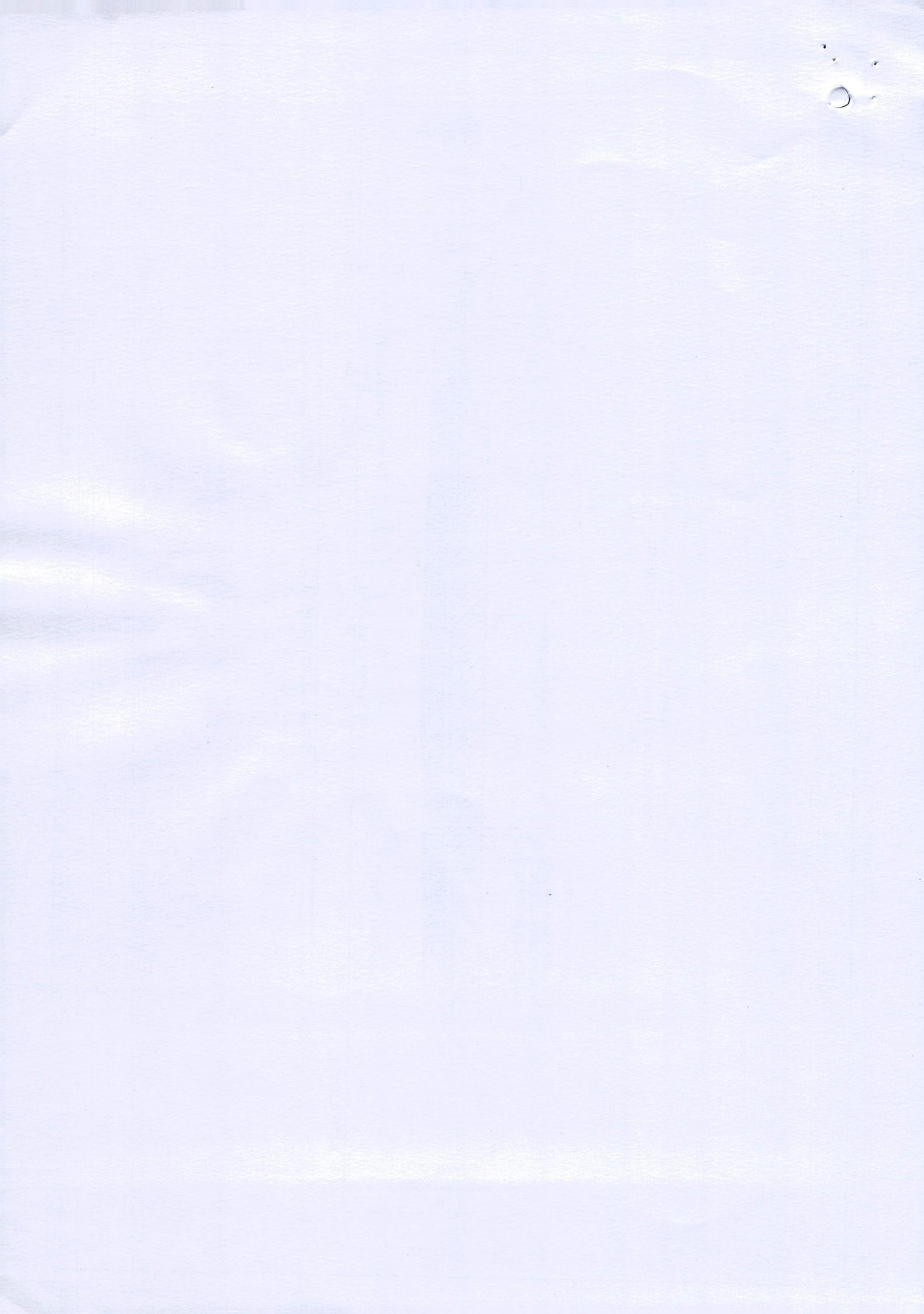
TYPICAL CROSS SECTION
TWO LANE CARRIAGeway (RURAL SECTION)

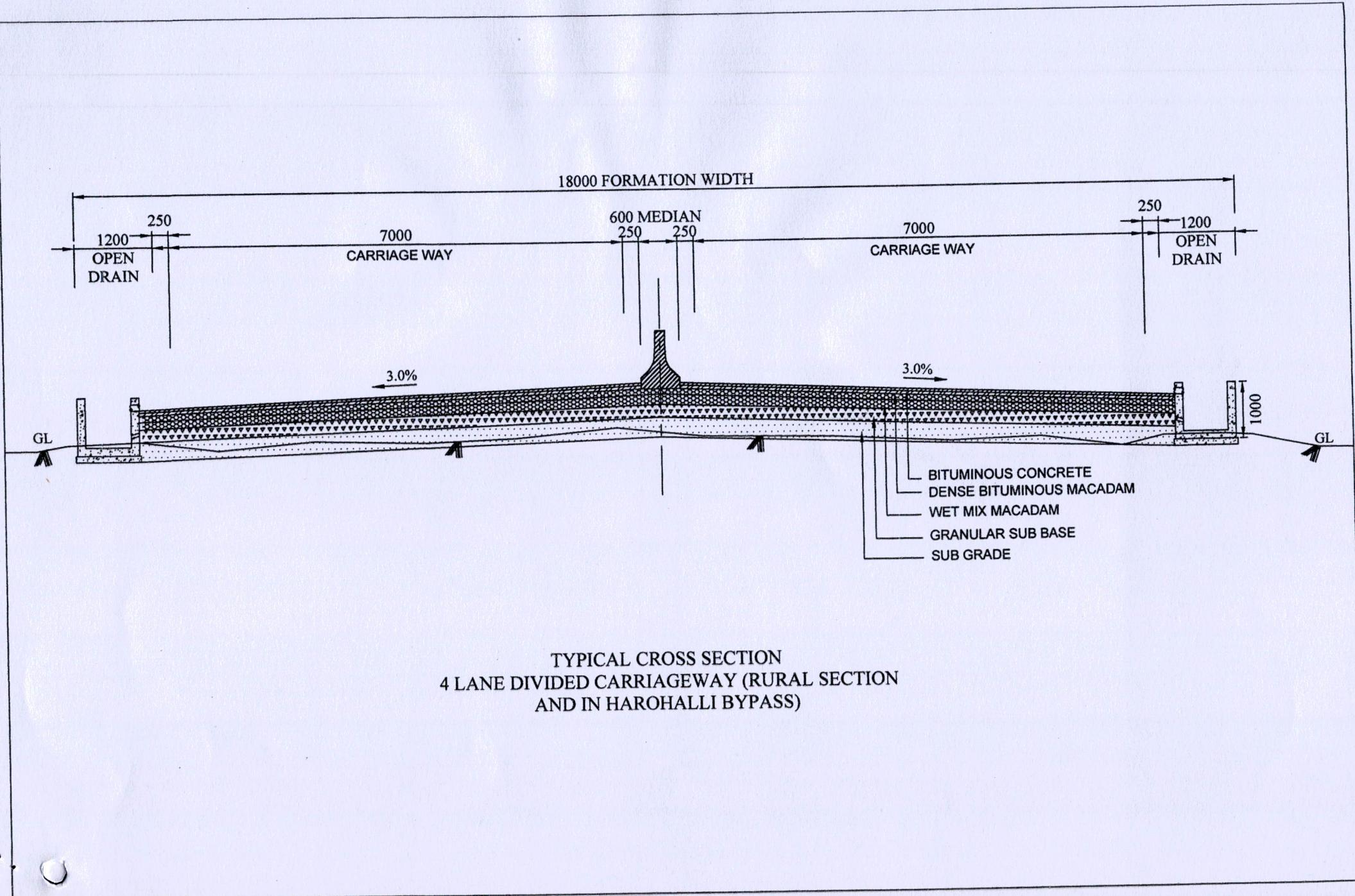


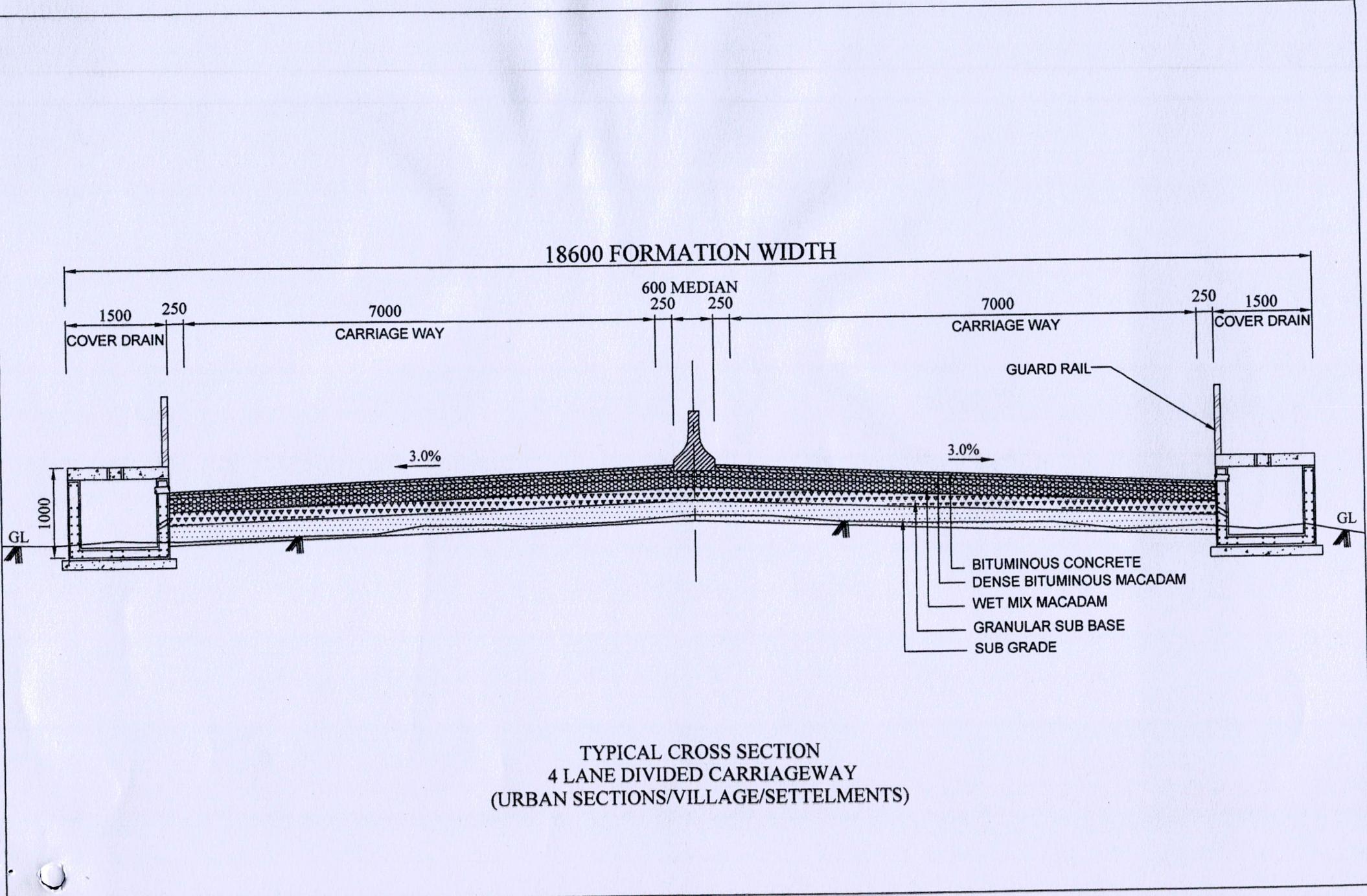


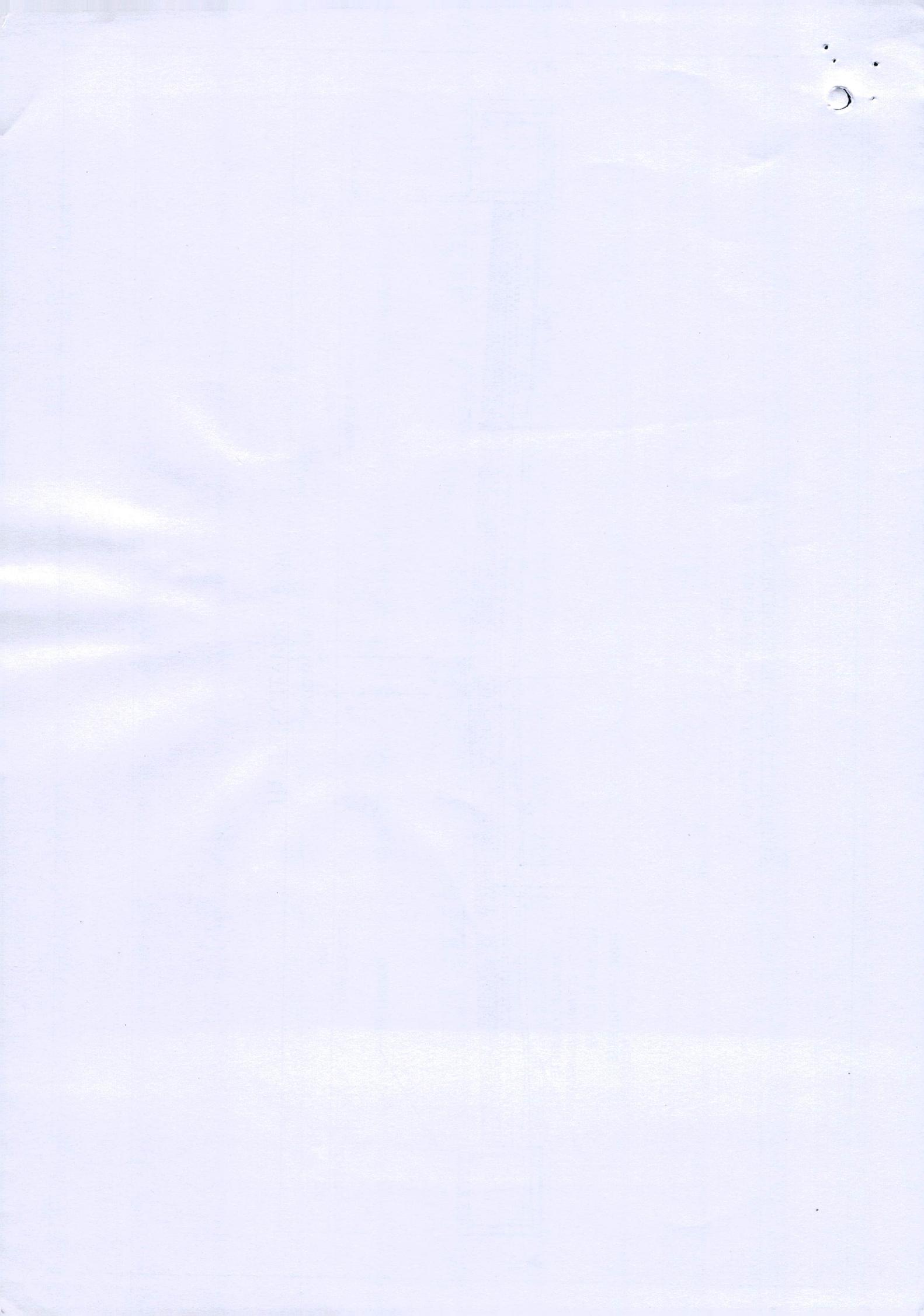


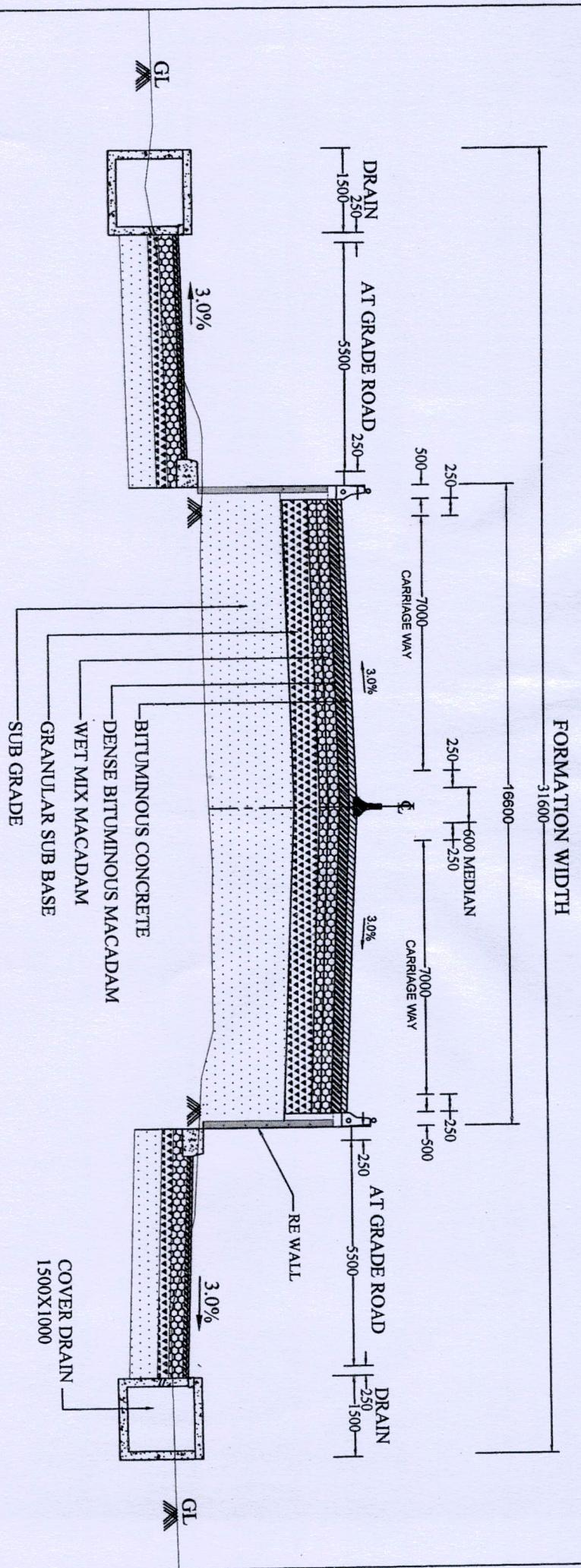
TYPICAL CROSS SECTION
2 LANE CARRIAGE WAY WITH PAVED SHOULDER
(FOREST AREA)



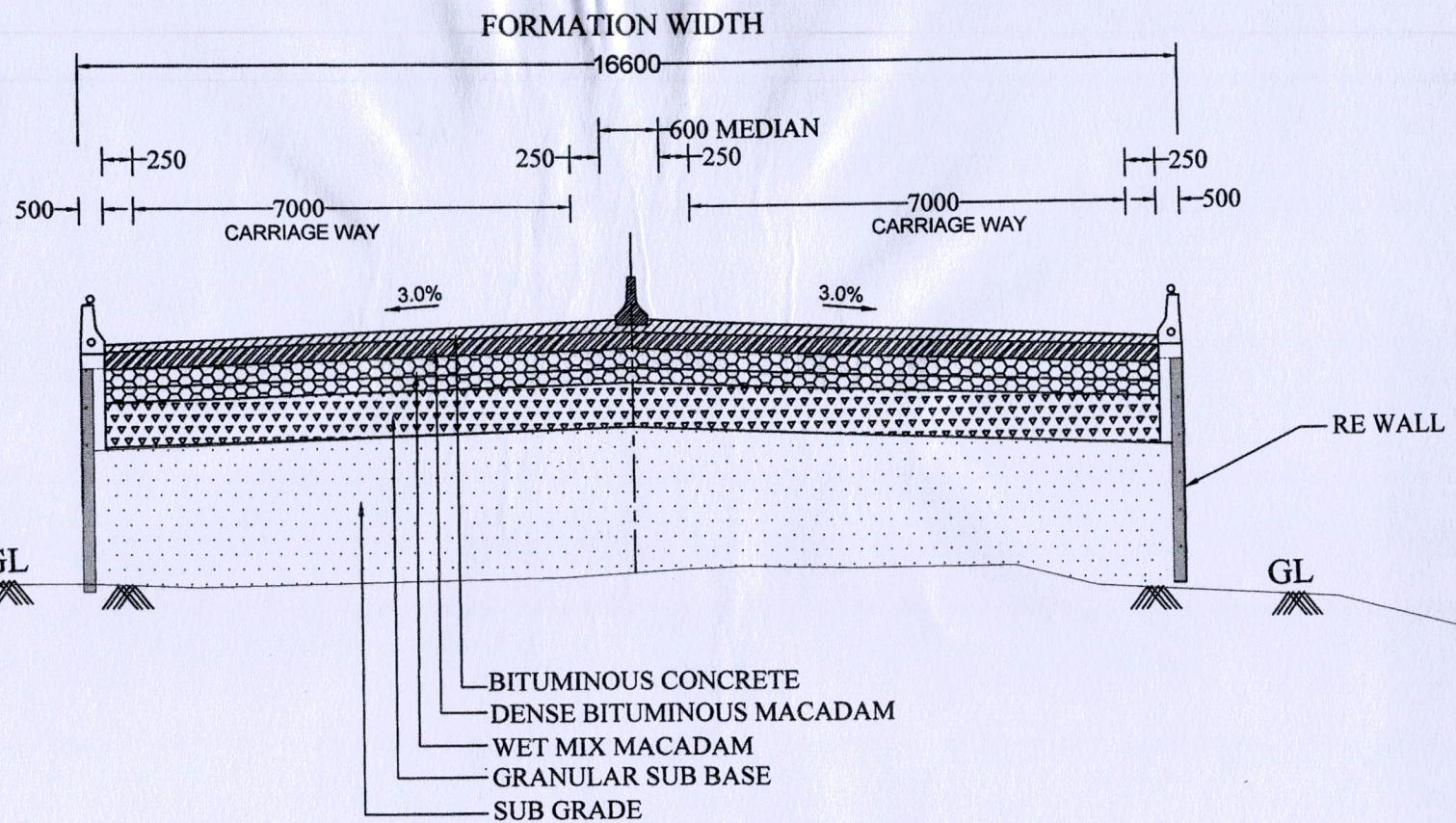








TYPICAL CROSS SECTION
4 LANE GRADE SEPARATOR (AT ANEKAL BYPASS)



TYPICAL CROSS SECTION
4 LANE ROB (AT ANEKAL BYPASS)

